REMARKS

Applicants would first like to thank the examiner for his phone conference on October 22, 2002. During the conference examiner indicated that the claims needed to be more specific to be allowable. Along with these comments, the Official Action dated August 21, 2002, has been carefully considered. Accordingly, the changes presented herewith, taken in conjunction with the following remarks, are believed sufficient to place the application in condition for allowance.

In the Official Action Examiner objected to the disclosure based on the informality that a brief description of the drawing was not present. Applicants respectfully draw the Examiner's attention to page 4, ln23, of the application. The section is titled "Brief Description of the Drawings." Further, on page 5, lines 3 to 4, a brief description of Figure 1 is stated. Applicants have amended this brief description herein to provide greater clarity. Applicants request the objection be withdrawn.

Examiner rejected claim 8 under 102(b) as being anticipated by Worner. Worner discloses a method including a process including the steps of mixing steelworks dust and sewage to form a mixture to form a wet sludge and a step of drying the sludge.

However, as will be set forth below, Applicants submit that the method of recycling exhaust waste material as defined by claim 8, amended herein, is not anticipated by Worner. Accordingly, the rejection of claim 8 is traversed and reconsideration is respectfully requested.

Anticipation under 35 U.S.C. 102 requires the disclosure in a single prior art reference of each element of the claims under consideration, *Alco Standard Corp. v. TVA*, 1 U.S.P.Q.2d 1337, 1341 (Fed. Cir. 1986). The invention, as defined by claim 8, is directed to a method of recycling exhaust waste material. The method of claim 8 comprises recovering the exhaust waste material from an electric arc furnace, drying the exhaust waste material, adding scrap steel to the electric arc furnace, and adding the exhaust waste material to the electric arc furnace wherein iron from the exhaust waste material is recycled. Applicants find no teaching or suggestion in Worner for recovering the exhaust waste material from an electric arc furnace, drying the exhaust waste material, adding scrap steel to the electric arc furnace, or adding the exhaust waste material to the electric arc furnace wherein iron from the exhaust waste material is recycled.

In view of the failure of Worner to teach or suggest each element of claim 8, Worner does not anticipate the present claim 8 under 35 U.S.C. δ102. It is therefore submitted that the rejection under 35 U.S.C. δ102 has been overcome. Reconsideration is respectfully requested.

Claims 1 to 29 were rejected under 35 U.S.C. 103 (a) as being obvious over Calderon et al. (US 6,214,085) in view of Lehner et al. (US 5,853,453) and Morris (US 4,304,609). This rejection is respectfully traversed.

Applicants point out that claims 2, 3, 7, 21, 23, 24 and 27 were broadly rejected as being obvious over Calderon in view of Lehner and Morris but no specific reason was

asserted. Applicants according believe that the amendments and reasoning herein place these claims in condition for allowance.

In making the above rejection of claims 1 to 29, Examiner specifically asserts that claims 1, 8, 22 and 26 are unpatentable because Calderon discloses (1) a method for direct steelmaking including the step of pneumatically injecting a fluxed iron/carbon product with immediate foaming of the slag, the iron/carbon product having been made by mixing iron ore concentrate, coal and dolomitic limestone, (2) a material feeding system feeding material into hopper 14, (3) the materials comprising iron ore such as iron ore concentrate and other iron bearing materials such as effluent dust and scale, and (4) where these materials may also be dried prior to delivery to the hopper.

A case of obviousness can only be established by combining the teachings of the prior art where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills,* 916 f.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990).

In the present claim 1 post combustion material (PCM) is used. Calderon disclose iron-bearing materials such as iron oxide, effluent dust and scale, however, none of these are PCM. Effluent dust is not in anyway defined in Calderon, however, even if the effluent dust in Calderon is intended to be baghouse dust, which it arguably is not, it is definitely

not PCM. In the Background of the Invention, page 1, lines 12-13, PCM is described as particles that are too heavy or too large to be exhausted to the bag house and thus is clearly not baghouse dust nor an effluent dust.

On page 1, lines 13-15, PCM is defined as exhaust material from the furnace that is gravity fed from the combustion chamber to the drop out box. The Environmental Protection Agency (EPA) also holds a distinction between baghouse dust and drop out box slag, i.e. drop out box material. The EPA regulates bag house dust under hazardous waste code KO61 but, while the EPA acknowledges drop out box material, the EPA specifically does not regulate drop out box material as hazardous. The EPA's acknowledgement of drop out box material serves to place PCM and/or drop out box material as a terms of art known to those skilled in the art of steel making.

These deficiencies of Calderon are not resolved by Lehner or Morris because they too fail to suggest a material such as PCM.

In claim 8 an exhaust waste material is recovered from an electric arc furnace. In claim 22 a method of manufacturing steel is conducted in an electric arc furnace. Lastly, in new claim 30 and claim 26 a steel processing material contributes iron that is only a portion of the iron in the heat and of less than about 1% by weight of the total iron in the heat, respectively.

However, the Calderon reference establishes at the outset that it is a purpose of the patent to eliminate facilities such as blast furnaces and electric arc furnaces (col. 2, lines 18-27). Calderon further teaches the making of steel only by the iron in the fluxed iron/carbon

product (col. 7, line 35 to col. 8, line 42), that is, 100% of the iron in a heat made by the Calderon process is supplied by the fluxed iron/carbon product. By teaching away from the use of an electric arc furnace and by teaching the recovery of iron from the mixture Calderon being the sole source of iron in a heat, Calderon fails to provide the necessary motivation to look to secondary references, such as Lehner and Morris, for the present invention. Therefore, Examiner's combination of the Calderon, Lehner and Morris references to purportedly teach the claims 1, 8, 21, 22 and 26 of the present invention is improper. Therefore, these claims are believed to be allowable in their present form and withdrawal of the rejection is respectfully requested. Further, claims 2-7, 9-20, 23-25 and 27-29, dependent on allowable claims, are also allowable and withdrawal of these rejections is also respectfully requested.

Claims 4, 14 and 15 were also rejected under 35 U.S.C. § 103(a) as being unpatentable over Calderon in view of Lehner. In the Official Action, the Examiner admitted Calderon's failure disclose the water content in the mix, but asserted it would have been obvious to one having ordinary skill in the art to combine the teaching of Lehner to form a material with a low amount of water in order to provide sufficiently high strength particles for use in the converter. Lehner discloses the water content of dehydrated granules formed from sludge that may advantageously contain a residual moisture of a maximum of 5 wt. % free water, which the examiner suggest to combine with Calderon to dry the materials in Calderon. The Examiner asserts that the combining of these references makes obvious drying PCM to less than about 2% water in producing the steel processing

material of claim 4 or in the method of claim 14, and in the air drying of PCM to 6% to 8% in claim 15.

The deficiencies of Calderon are not resolved by Lehner. More specifically, Lehner discloses a sludge that is first dehydrated at 30 to 50% hydration and mixed with quicklime to completely react the quicklime with the water in the sludge. The 30 to 50% hydration is clearly outside the less than about 2% water of claim 4 and 14 or the 6% to 8% of claim 15. Next, Lehner discloses drying the sludge and quicklime mixture to a maximum of 5 wt. % residual moisture free water. The purpose of this drying step is so that the mixture "will not swell or drive (sic?) up even after storage for some time" (col. 5, lines 47-48) . Clearly, the 5% maximum is outside the 6 to 8% range of claim 15. Arguably, the 5% maximum hydration of Lehner may include the 2% maximum water content in claims 4 and 14, however, the 5% maximum drying step in Lehner is only conducted after mixing sludge and quicklime. In contrast, in present claims 4 and 14, the drying of the PCM occurs before the PCM is mixed with other materials. Further, the motivation for drying in Lehner is to provide strength in the granulate form of the mixture (col. 5, lines 52-55). The motivation for drying in the present invention includes castability and porosity of the steel, melting time, steel cleanliness, furnace life, costs and safety (p.6, lines 1-8). Further, sizing of the PCM in the current invention is accomplished by other means, such as by screening, and is unrelated to the water content. Thus one skilled in the art would not be motivated to combine the teaching of Lehner to resolve the deficiencies of Calderon to include drying PCM to less than about 2% water in producing the steel processing material of claim 4 nor in the method of claim 14, nor in the air drying of PCM to 6% to 8% in claim 15.

Claims 9-13 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Calderon in view of Morris. Examiner asserts that Morris discloses a rotating auger heated by an induction coil which may be used to pre-dry the Calderon materials.

The deficiencies of Calderon are not resolved by Morris. As stated earlier, the Calderon teaches away from use of an electric arc furnace.

Claims 18-20 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Calderon. Examiner asserts that Calderon discloses transporters 15 which are equivalent to the claimed containers. However, the transporters of Calderon receive a gravity fed hot product crushed by rollers and contain a hot combustible gas (col. 6, lines 42-43). The transporters are pressurized by the hot combustible gas to allow blowing of the hot product from the transporter, through a piping system and diverter valve, and into a furnace. These pressurized transporters from Calderon bear little resemblance to the first exhaust waste material container of claim 18. The first exhaust waste material container is not pressurized by hot gas, is not connected to a piping system and does not contain a converter valve. Further, the product of Calderon is not PCM as previously discussed.

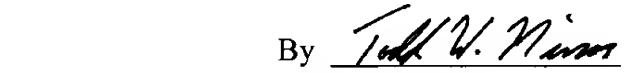
Claims 5, 6, 12, 16, 17, and 25 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Calderon. Examiner asserts that Calderon discloses injecting pneumatically. Calderon does disclose using rolls to crush the iron/carbon product to a size suitable for pneumatic injection (col. 5, lines 2-6) however the "crushing" of Calderon is not "sorting" exhaust waste material as claimed in claims 12, 16, and 17, nor does Calderon obtain a fraction having an average particle size of about 3/4 of an inch and processable by

a screw auger prior to drying as claimed in claim 12, nor does Calderon obtain a fraction having an maximum particle size of about 5/16 of an inch as claimed in claim 17.

Claims 28 and 29, herein rewritten as claims 31 and 32, were rejected under 35 U.S.C. § 103(a) as being unpatentable over Calderon in view of Lehner. In the Official Action Examiner asserted that with respect to claims 28 and 29 Lehner et al. discloses enrichment zinc, lead or alkalis. Lehner does discloses discharging about 10% of granulate to avoid enrichment (col. 6, lines 10-17), however, Lehner does not disclose repeating steps until the concentration of heavy metals in the PCM reaches a set point as in claim 31 or sending PCM to a reclamation process once the concentration of heavy metals in the PCM reaches the set point as in claim 32. Clearly, discharging 10% is not the same as repeated use until the concentration reaches a setpoint and then discarding the material.

Therefore, Applicants submit that the steel processing material defined by claims 1-7 and 26-30, the method of recycling exhaust waste material of claims 8-20, and the method of manufacturing steel in an electric arc furnace of claims 22-25 and 31-32 are nonobvious over and patentably distinguishable from Calderon in view of Lehner or Morris. Accordingly, these rejections are traversed and reconsideration is respectfully requested.

Respectfully submitted,

By 

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Marked Up Copy of Amendments

On page 5, in the Brief Description of the Drawings, substitute the pending paragraph beginning on line 3 with the following:

Fig. 1 illustrates a schematic view of an exemplary embodiment of a post combustion material (PCM) [PCM] reclamation facility in accordance with the present invention.

On page 5, in the Detailed Description of the Exemplary Embodiments, substitute the pending paragraph beginning on line 11 with the following:

Solid waste material such as Furnace Exhaust Material (FEM) is generated by the steel making process. The current invention contemplates removing some of the moisture content and/or otherwise recycling FEM material back into the process. The FEM is typically generated as particles collected from the drop out box, known as Post Combustion Material (PCM), or dust from the bag house, as described above. Different plants or operations in the steel industry may use different terms other than drop out box particles or bag house dust, however, the term "furnace exhaust [post combustion] material" as used in this invention should be understood to cover any iron-bearing material from the exhaust of a steel making furnace. Such furnaces may include a basic oxygen furnace, an electric arc furnace, a degasser, or any similar furnace creating solid material from the exhaust chamber. The iron-bearing [post combustion] material as used in the current invention further includes iron-bearing solid waste materials such as iron fines, scale, iron oxide from pickle liquor, or other similar steel making materials as known to those skilled in the art.

On page 12, in the Detailed Description of the Exemplary Embodiments, substitute the pending paragraph beginning on line 13 with the following:

An exemplary [exempary] comparison of [batch recovered a charging PCM in charge buckets,] drying and mixing PCM with slag foaming materials and batch charging the mixture in charge buckets will now be discussed. Approximately 10,000 [1,000] pounds of PCM was [is] batch charged into a 200 ton heat of steel. Nitrogen increased [increases] in the steel by 15 parts per million (PPM). Further, when PCM was [is] directly charged in the bucket, the kilowatt hour per scrap ton (KWH/ton) increased [increases] by about 37 KWH/ton. However, when the PCM was [is] dried and mixed with slag foaming material in an amount of about 95% by weight slag foaming material and 5% by weight PCM (the mixture added weighing about 6400 pounds per heat, a typical foamy slag addition weight), an increase in KWH was [is] not seen and the KWH actually appeared [appears] to decrease. This may have been [be] due to oxidation of iron and manganese. Also, there was no increased nitrogen in the steel and the FeO weight percent in the slag did not increase.

In the Claims:

1. (Amended) A steel processing material for addition into a heat of steel in a steel making furnace comprising:

(a) a dried post combustion material (PCM) recycled from the exhaust of the steel making furnace, and

(b) a slag foaming material.

8. (Amended) A method of [preparing a steel processing material making process] recycling exhaust waste material from an electric arc furnace comprising:

(a) recovering the exhaust waste material from an electric arc furnace; [process; and]

(b) drying the exhaust waste material [PCM];

(c) adding scrap steel to the electric arc furnace; and

(d) adding the exhaust waste material to the electric arc furnace wherein iron from the exhaust waste material is recycled.

9. (Amended) The method of [preparing a steel processing material] recycling the exhaust waste material of claim 8 wherein drying is conducted in a screw auger dryer.

10. (Amended) The method of [preparing a steel processing material] recycling the exhaust waste material of claim 9 wherein the screw auger dryer comprises an induction heater.

11. (Amended) The method of [preparing a steel processing material] recycling the exhaust waste material of claim 9 further comprising sorting the PCM to obtain a fraction having an average particle size processable by the screw auger prior to drying.

12. (Amended) The method of [preparing a steel processing material] recycling the exhaust waste material of claim 11 wherein exhaust waste material [PCM] is sorted to obtain a fraction having a particle size of about 3/4 of an inch.

13. (Amended) The method of [preparing a steel processing material] recycling the exhaust waste material of claim 8 wherein the drying is conducted in a rotary dryer.

14. (Amended) The method of [preparing a steel processing material] recycling the exhaust waste material of claim 8 wherein drying the exhaust waste material [PCM] comprises drying the exhaust waste material [PCM] to not greater than about 2% water content.

15. (Amended) The method of [preparing a steel processing material] recycling the exhaust waste material of claim 8 wherein drying the exhaust waste material [PCM] comprises air drying the exhaust waste material [PCM] to about 6% to about 8% water content.

16. (Amended) The method of [preparing a steel processing material] recycling the exhaust waste material of claim 8 further comprising sorting the exhaust waste material [PCM] to obtain a fraction having an average particle size processable by an injection gun.

17. (Amended) The method of [preparing a steel processing material] recycling the exhaust waste material of claim 16 wherein the exhaust waste material [PCM] is sorted to obtain a fraction having a maximum particle size of about 5/16 of an inch.

18. (Amended) The method of [preparing a steel processing material] recycling the exhaust waste material of claim 8 further comprising conveying the dried exhaust waste material [PCM] to a first container.

19. (Amended) The method of [preparing a steel processing material] recycling the exhaust waste material of claim 8 further comprising mixing the dried exhaust waste material [PCM] with a slag foaming material.

20. (Amended) The method of [preparing a steel processing material] recycling the exhaust waste material of claim 19 wherein mixing is conducted by adding the dried exhaust waste material [PCM] and concurrently adding slag foaming material into a container.

22. (Amended) A method of manufacturing steel in an electric arc furnace comprising:

(a) melting in the electric arc furnace a first heat of steel comprising a liquid steel portion and a foamy slag portion [wherein the melting generates a post combustion material (PCM)];

(b) [drying the PCM] evacuating the emissions from the first heat wherein solid waste material is exhausted from the heat; [and]

(c) [adding the dried PCM into a second heat of steel] mixing the solid waste material with a slag foaming material to form a steel processing material; and

(d) adding the steel processing material into a second heat of steel. 23. The method of manufacturing steel of claim 22 wherein the PCM is recovered from the first heat.

23. The method of manufacturing steel of claim 22 wherein the [PCM] solid waste material is recovered from the first heat.

24. (Amended) The method of manufacturing steel of claim 22 further comprising [mixing the dried PCM with a slag foaming material] drying the solid waste material before [the dried PCM is added to the second heat of steel] mixing the solid waste material with a slag foaming material.

25. (Amended) The method of manufacturing steel of claim [23] 22 wherein the adding of the [dried PCM] steel processing material into a second heat of steel comprises injecting the [dried PCM] steel processing material with an injection gun.

26. (Amended) A steel processing material, at least partially recycled from an electric arc furnace, comprising:

(a) [a] an iron-bearing [recycled] material having less than 2% moisture by weight and recycled from the arc furnace; and

(b) a slag foaming material

wherein the steel processing material contributes to the foaming of slag when added to a heat of steel in the arc furnace and reacts with the heat to recover iron from the iron-bearing material to the heat, the recovery of iron being less than about 1% by weight of the total iron in the heat.

27. (Amended) The steel processing material of claim 26 wherein the iron-bearing material is post combustion material, bag house dust, scale, or iron fines.